

# A POPULATION STUDY OF TWO SPECIES OF NON-HUMAN PRIMATES: *MACACA MULATTA* AND *MACACA RADIATA*<sup>1</sup>

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(With two text-figures)

A population of 1496 rhesus monkeys living in 38 groups, and a population of 664 bonnet monkeys living in 31 groups, was counted in the forests of Dehra Dun and the forests and the urban areas of Mysore respectively. The rhesus monkeys had a mean group size of 39.37 individuals, whereas the bonnet monkeys had a mean group size of 21.42. Significant differences were found in the group size, the adult male and the adult female sex ratios between the two species. The importance of population studies is discussed from two view points: a) the species- and the population-specific adaptations to a particular ecological niche, b) conservation of these two primate species.

## INTRODUCTION

A population study of non-human primates is important for two reasons: First, the ultimate group size (Crook 1972) and the 'socio-economic sex ratio' (Carpenter 1934) in the groups of primates living in their natural environment are the adaptive social behaviour patterns to the ecological pressures, and so, are directly shaped by the evolutionary contingencies. Second, a few surveys on the populations of rhesus (Southwick *et al.* 1961a, b; Lindburg 1971; Neville 1968) and bonnet (Simonds 1965; Nolte 1955; Rahman and Parthasarthy 1969) monkeys were made in early and mid sixties. Since then, many noticeable environmental changes such as afforestation,

agricultural expansion, unfavourable attitudes of the people toward monkeys, trapping of monkeys for experimental and hygienic purposes etc., have taken place. These drastic changes have threatened the very survival of these two monkey species. A new survey was required to be made on these species from the view point of conservation, as well as to study their group size and socioeconomic sex ratios with reference to the ecological forces.

## STUDY AREAS AND METHODS

The present study was conducted in the years June to November, 1975, on rhesus and August to October, 1978, on bonnet. The study areas included 3 divisions of Dehra Dun forests viz., Eastern, Western and Siwalik (for rhesus), and Mudumalai and Bandipur wildlife sanctuaries and the roadsides in and around Mysore City (for bonnet) (Fig. 1).

The forests of Dehra Dun are moist decidu-

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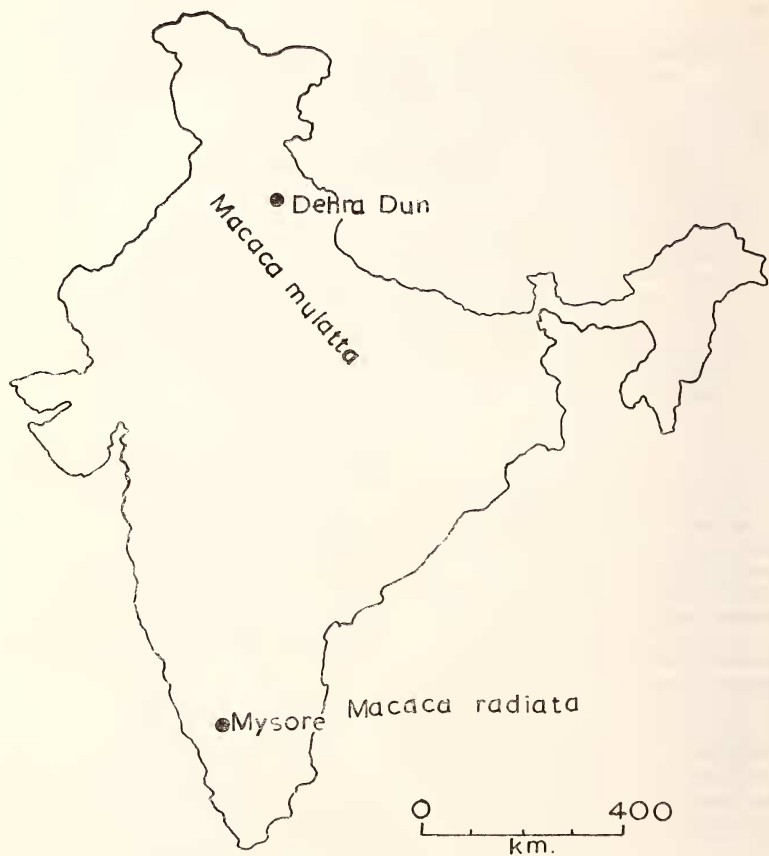


Fig. 1. Map of India showing the locations of study areas.

ous type and mainly covered by sal (*Shorea robusta*) trees. Large mammals such as panther (*Panthera pardus*), tiger (*Panthera tigris*) and elephant (*Elephas maximus*) are rare, but spotted deer (*Axis axis*) and langur (*Presbytis entellus*) are common. In the forests of Mudumalai and Bandipur, elephant, tiger, panther, wild boar (*Sus scrofa*), gaur (*Bos gaurus*), wild dog (*Cuon alpinus*), spotted deer, sambar (*Cervus unicolor*) and langur are common. Most of the bonnet groups were found outside the forest, inhabiting roadsides near agricultural areas covered with a thick vegetation of banyan (*Ficus bengalensis*), pipal (*Ficus religiosa*) and imli (*Tamarindus indica*) trees.

All these areas were visited on foot, and the monkeys were counted with naked eyes. The individuals were classified into four categories, i.e. adult male, adult female, juvenile, and infant (for the details of the basis of classification—see Southwick 1961; Pirta and Singh 1978).

## RESULTS

A total of 1496 individuals were counted in 38 groups of rhesus monkeys, with a mean group size of 39.37. In bonnets, 31 groups were counted, with an average group size of 21.42 and a total of 664 monkeys. A comparative analysis of the group size for the two species yielded a significant difference (Table 1).

The per cent for each category of individuals was computed against the total animals of each group. A 't' analysis of significance was applied to compare the group composition for the two species. The mean per cent, 23.7 of males in bonnets was significantly higher than

the mean per cent, 11.5 in rhesus ( $P < .01$ ). On the other hand, the mean per cent, 26.9 for female bonnets was significantly less ( $P < .01$ ) than the mean per cent, 32.0 for the rhesus female. A comparison of the mean percentages for juveniles and infants revealed non-significant difference between the two species (Table 2).

A significantly higher per cent of males in bonnets, and a significantly higher per cent of females in rhesus affected the socioeconomic sex ratio (adult male: adult female) of the two species, which was found to be 1:3.0 in rhesus and 1: 1.2 in bonnet monkeys (Fig. 2).

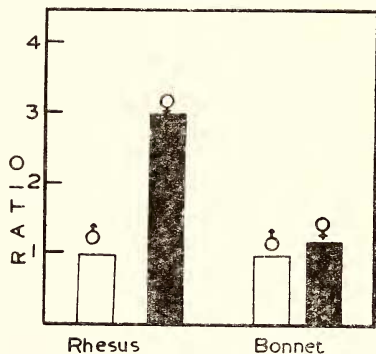


Fig. 2. Socioeconomic sex ratio (Adult male: adult female) in rhesus and bonnet macaques.

For the study of population dynamics, a bonnet group was observed for four years. In spite of an average of 5 females breeding each year, the size of the group increased from 23 to 29 only, though, slight changes took place in the socioeconomic sex ratio (Table 3).

TABLE 1

DIFFERENCES IN GROUP SIZES OF RHESUS AND BONNET MONKEYS.

Species	No. of groups	No. of monkeys	Mean group size	't'	df	P
Rhesus	38	1496	39.37			
Bonnet	31	664	21.42	4.67	67	0.01

TABLE 2

DIFFERENCES IN GROUP COMPOSITION OF RHESUS AND BONNET MONKEYS.

Age/sex classes	Species	Mean% per group	't'	df	P
Adult ♂	Rhesus	11.5	6.89	67	0.01
	Bonnet	23.7			
Adult ♀	Rhesus	32.0	3.29	67	0.01
	Bonnet	26.9			
Juveniles	Rhesus	37.4	1.65	67	0.20
	Bonnet	33.1			
Infants	Rhesus	19.1	1.65	67	0.20
	Bonnet	16.3			

TABLE 3

HISTORY OF A BONNET GROUP.

Year	Group size	Adult males	Adult females	Juveniles	Infants	Socioeconomic sex ratio
Oct., 1974	23	4	5	9	5	1:1.2
June, 1975	27*	4	5	14	4	1:1.2
June, 1976	32!	10	6	11	5	1:0.6
June, 1977	29!*	8	7	11	3	1:0.8
Feb., 1978	5**	1	2	1	1	

\* 5 monkeys left the group.

! 4 monkeys died when the group moved out of its home range.

!\* The whole group was trapped except 5 individuals.

\*\* These 5 monkeys were also not seen in the area after some time.

## DISCUSSION

It was found in the present study that the percentages of infants and juveniles were not different statistically between the two primate species. On the other hand, the percentages of adult males and adult females were significantly different—females constitute a larger part of the adult section of the group in rhesus, whereas the bonnet group contains an equal number of males and females. The male—female sex ratio in infant rhesus is found equal (Lindburg 1971). This indicates that there is no difference in the reproductive strategy of the two species. The less number of adult rhesus males may be due to the reason that during the process of development, a considerable number of males is eliminated from the group. On the other hand, the bonnet males enjoy an equal ratio with the females. Several investigators have indirectly attempted to explain this phenomenon. It has been reported that the kinship ties are stronger in bonnets than in rhesus (Rosenblum 1970). Pirta and Singh (1979) reported that many rhesus males, who leave the group, get wider knowledge of the habitat. If they join the natal group again, they will prove to be more efficient leaders. It may be possible that, because a less number of males is sufficient to inseminate a larger number of females, the extra males are thrown out of the group. But the last two explanations are not applicable in case of bonnet monkeys. Only a thorough investigation of the ecological forces and adaptations will explain such differences.

Similarly, another explanation is required for the differences observed in the group sizes of two different populations of the same species. A very interesting phenomenon was observed in the present study. The group size

was larger in the interior forest areas (mean 48.0) than the areas near to human interaction (mean 31.0) in rhesus, whereas the bonnet were in larger groups in the urban and semi-urban areas (mean 22.8) than their forest counterparts (mean 13.8). These variations indicate that the group size, though, is a species-specific characteristic, it is prone to change according to the modification in the ecological niche. Predation, trapping, afforestation and the agricultural expansion may bring about significant variations in the group size. It seems that these factors have brought about the above mentioned population—specific (urban and forest) differences in group size. On the other hand, the differences in the group sizes of rhesus and bonnet living in the forest areas may be because of the differences in the energy requirement of the two species, though the energy yield of these forests may be same.

The present study, with reference to the old surveys made on rhesus and bonnet populations, reveals that the habitats of these species are changing tremendously. Southwick *et al.* (1961a) reported that 11% villages of Dehra Dun had resident monkey groups, but during our survey, no group was found in any of those villages. Siddiqi and Southwick (1975) found that "a population sample of rhesus monkeys in an agricultural area of western U.P. declined from 403 monkeys in 21 groups in 1962 to 197 monkeys in 11 groups by 1974." Similarly, Simonds (1965) reported some bonnet groups in the forest areas, some of which have totally vanished. In one group of Bandipur forest, 15 monkeys were observed two years before, and now there are only 5 animals. It was also observed that bonnet monkeys are very rare in the interior forest, and some groups which do live in jungle are found

near tribal huts or the forest bungalows.

On the other hand, the changes taking place in the urban groups of bonnet are peculiar. A group was observed for four years, in which sudden increases or decreases of sex ratio were found. The pressures of the urban areas are quite different than those of the semi-urban, agricultural and the forest areas. However, the severity of these pressures is quite threatening

to the survival of these monkeys irrespective of the habitat.

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